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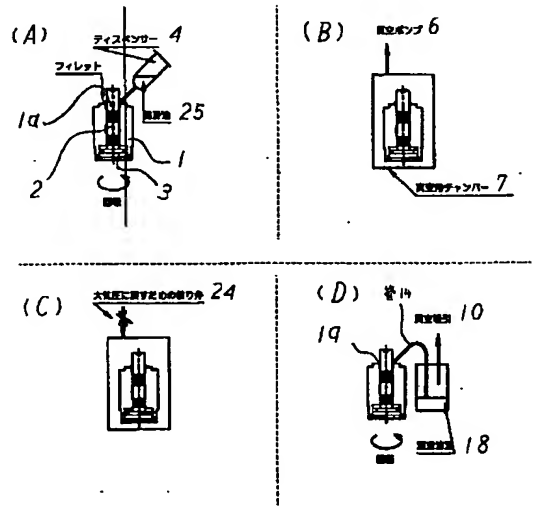
(54)【発明の名称】　流体軸受の粘性流体充填方法、モータ

(57)【要約】
【課題】動圧を生じる粘性流体である潤滑油２５中の気泡が確実に除去され所定の空間内に潤滑油の充填が確実になされることにより動圧の生成にムラが生じない流体軸受の粘性流体充填方法を提供する。
【解決手段】潤滑油２５を注入した組立て体周囲の環境を減圧して軸受内部の空気を予め排気し（図１（Ｂ）図示の工程）、その後に組立て体の環境を徐々に常圧に復帰し粘性流体を所定空間内に押圧充填する（図１（Ｃ）図示の工程）方法とする。



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【特許請求の範囲】
【請求項１】軸体と、
開穴部から底部側に向かって回転可能なように挿入される前記軸体の外周面に近接する内周面部と、この内周面部に連設しかつ前記軸体の外周面に所定の空隙をもって対向する溜まり部とを備えた挿入穴を有する流体軸受部とを具備した組立体における、前記開穴部周縁に滴下した粘性流体で前記挿入穴内を充填する流体軸受の粘性流体充填方法であって、
前記開穴部に挿入された前記軸体の外周面に添接しつつ前記開穴部周縁へ粘性流体を所定量滴下する滴下ステップと、
次に、粘性流体を滴下した前記組立体の外部を減圧状態にして、前記開穴部側から前記挿入穴内の空気を排気する排気ステップと、
次に、減圧状態が常圧状態に復帰する際の大気圧で前記開穴部周縁の粘性流体を前記挿入穴内に充填する充填ステップとを有することを特徴とする流体軸受の粘性流体充填方法。
【請求項２】請求項１記載の流体軸受の粘性流体充填方法によって粘性流体が充填された前記組立体を用いて構成されたモータであって、
前記組立体の底部を固着したステータを備えたことを特徴とするモータ。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、例えばハードディスクドライブ（ＨＤＤ）用又はＣＤ－ＲＯＭドライブ用のモータ、このモータを製造する際の流体軸受の粘性流体充填方法に関する。
【０００２】
【従来の技術】従来、軸体（軸、シャフト）と、軸体が挿入される孔部（挿入穴）を有する軸受体（軸受、スリーブ、流体軸受部）と、軸体と軸受体とが向かい合う所定空間内に保持される粘性流体（潤滑油、空気等）とを備え、軸体と軸受体との相対回転時に粘性流体内に生じる動圧により軸受体が軸体を回転自在に支承する流体軸受を有するモータが周知である。
【０００３】また従来、動圧を発生する粘性流体として潤滑油等の液状の粘性流体を流体軸受に注入する方法として以下のものが知られていた。すなわち（１）軸受装置全体を潤滑油中に浸したのち装置全体を減圧し潤滑油を注入する方法（米国特許５１１２１４２号公報に記載、以下「第１の従来技術」と記す）、（２）潤滑油を軸受組立て体の外周面に塗布し毛細管現象により注入する方法（以下「第２の従来技術」と記す）、（３）軸受装置を組立てる前に流体軸受を構成する部品に潤滑油をあらかじめ塗布しておく方法（以下「第３の従来技術」と記す）、（４）軸受装置の組立て後に常圧環境下において軸受開口部から潤滑油を注入し浸透させる方法（以下「第４の従来技術」と記す）、（５）軸受を構成する部品を組立てながら粘性流体である潤滑油を数回塗布する方法（以下「第５の従来技術」と記す）等である。

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【０００４】
【発明が解決しようとする課題】ＨＤＤ用モータやＣＤ－ＲＯＭドライブ用モータに流体軸受を使用する場合のモータ組立て上の重要な点は、動圧発生部の潤滑油中に気泡がなく、モータの外周部に不必要かつ有害な潤滑油が残らない様にすることである。そうすべき理由は、潤滑油中に気泡が残ると動圧の発生にムラが生じて流体軸受として正常に機能しない恐れがあり、またモータ外周部に不必要な潤滑油が残留すると、不浄物質となってディスク記録媒体等に付着しディスク媒体ドライブ装置の機能、性能を阻害する恐れがあるからである。
【０００５】然しながら上記した第１の従来技術は、軸受装置表面全体以外の不要部分に付着した潤滑油の除去が必要であるという問題があり、軸受間隙部分以外の不要な潤滑油を完全に除去する事は簡単ではなかった。このため特開平８－２７０６５３号公報の請求項３に記載の技術が考案されているが、工程が増えて効率が悪くなるという、新たな問題を生じさせた。
【０００６】また上記第２の従来技術は、間隙部分の全てに潤滑油を満たすことが難しく潤滑油の満たされない部分に気泡が残ってしまい、気泡を除去する事が出来ない、という問題があった。さらに上記第３の従来技術は、塗布むらや不均一の塗布になってしまう恐れがあり作業に熟練が必要であり、上記第４の従来技術は組立て時間が余計掛かり、上記第５の従来技術は余分な工数を要する、という其々の問題があった。
【０００７】そこで、本発明は、上記した問題点に鑑みてなされたものであり、特に開穴部に挿入された軸体の外周面に添接しつつ開穴部周縁へ粘性流体を所定量滴下する滴下ステップと、次に、粘性流体を滴下した組立体の外部を減圧状態にして、開穴部側から挿入穴内の空気を排気する排気ステップと、次に、減圧状態が常圧状態に復帰する際の大気圧で開穴部周縁の粘性流体を挿入穴内に充填する充填ステップとを有することにより、流体軸受に保持される粘性流体中の不要、有害な気泡を確実に除去し、粘性流体が充填されるべき空間に隙間無く確実に粘性流体を充填し、また余剰量の粘性流体を容易に除去可能として、動圧にムラが生じる恐れがなく、また潤滑油等の粘性流体が不浄物質となってディスク記録媒体を汚染する恐れもない流体軸受の粘性流体充填方法を提供することを目的とする。
【０００８】
【課題を解決するための手段】上述した課題を解決するために、本発明は、下記（１）、（２）の流体軸受の粘性流体充填方法、モータを提供する。
（１）　軸体（軸、シャフト）２と、開穴部（孔部１ａ上方の開口部）から底部側（図６　モータベース側）に

向かって回転可能なように挿入される前記軸体２の外周面に近接する内周面部（孔部１ａ内周面）と、この内周面部に連設しかつ前記軸体２の外周面に所定の空隙をもって対向する溜まり部（軸受１内部の孔部１ａ下方の空間）とを備えた挿入穴（孔部）１ａを有する流体軸受部（軸受）１とを具備した組立体における、前記開穴部周縁に滴下した粘性流体（潤滑油）２５で前記挿入穴内を充填する流体軸受の粘性流体充填方法であって、前記開穴部に挿入された前記軸体２の外周面に添接しつつ前記開穴部周縁へ粘性流体２５を所定量滴下する滴下ステップ（図１（Ａ）図示の工程）と、次に、粘性流体２５を滴下した前記組立体の外部を減圧状態にして、前記開穴部側から前記挿入穴１ａ内の空気を排気する排気ステップ（図１（Ｂ）図示の工程）と、次に、減圧状態が常圧状態に復帰する際の大気圧で前記開穴部周縁の粘性流体２５を前記挿入穴１ａ内に充填する充填ステップ（図１（Ｃ）図示の工程）とを有することを特徴とする流体軸受の粘性流体充填方法。

（２）　請求項１記載の流体軸受の粘性流体充填方法によって粘性流体（潤滑油）２５が充填された前記組立体を用いて構成されたモータであって、前記組立体の底部（図６　軸受１の底部）を固着したステータ（図６　モータベース）９を備えたことを特徴とするモータ（図６　ＣＤ－ＲＯＭドライブ用スピンドルモータ）１００。

【０００９】

【発明の実施の形態】以下、本発明の実施の形態につき好ましい実施例を、図１乃至図６を用いて説明を行う。図１は本発明の流体軸受の粘性流体充填方法、モータの一実施例における粘性流体充填を行なう各工程の説明図、図２は図１のモータにおいて潤滑油を供給するための凹部を設けた構成の流体軸受けの断面図、図３は本発明のモータの一実施例において撥油剤塗布領域を有する流体軸受けの断面図、図４は図１のモータの流体軸受けの組立図、図５は図１のモータにおいて遠心力により余剰の潤滑油を除去する工程の説明図、図６は図１のモータの断面図である。前述したものと同一部分には同一符号を付しその説明を省略する。

【００１０】まず、本実施例のモータであるＣＤ－ＲＯＭドライブ用スピンドルモータ１００の構造を図６の断面図を用いて説明する。

【００１１】図６において、スピンドルモータ１００の軸受１の下端（底部）は鉄ベースブリント基板で形成されたモータベース９に固定されている。また軸受１と、軸受１に形成された孔部１ａに挿入される軸２とが流体軸受を構成している。

【００１２】ラジアル方向に軸２を支承する流体軸受けであるラジアル軸受は、回転時に動圧を発生する動圧溝部８が軸受１内周及び／又は軸２外周に形成され、軸２の回転時に粘性流体中に発生する動圧により、軸受１が軸２を回転自在に支承する構成としている。なお、図６図示の動圧溝部８は平面的に模式的に描いてあるものである。

【００１３】スラスト方向に軸２を支承する流体軸受けであるスラスト軸受５は、軸２の下端に形成されたスラスト部の其々上下の対応面にスパイラル状動圧溝（不図示）を加工し流体軸受を構成している。（上下の方向は図６図示の姿勢を基準としている。以下同様）

【００１４】なお動圧溝はどちらの面に加工しても同様な効果が得られる。軸２と軸受１の間の所定空間内には潤滑油が充填され軸２の回転により潤滑油内部に動圧が生じ、軸受装置として機能する。

【００１５】流体軸受の潤滑油は軸２又は軸受１の回転により軸受外部へ流出すると回転が不可能となるため、流体軸受けの上下にシール部を構成し流出を防いでいる。

【００１６】モータベース９には軸受１に対し同心状にコイル１３を巻回したコア１２が固定され、流体軸受により回転自在に保持されたロータ２２には、ロータヨーク１７を有し下部内周側にリング状磁石１６が固着されている。

【００１７】次にスピンドルモータ１００の流体軸受における潤滑油の、充填をなすべき所定空間内への充填方法について説明する。

【００１８】まず図４の組立図により流体軸受けの構成を説明すると、軸受１は孔部１ａ内周部に２個所の動圧溝部８が形成され、軸２下端には上下の面を有するスラスト部２３を備え、ブレート３は軸２のスラスト部２３下面と対向する面に動圧溝を形成している。スラスト部２３を収納する軸受１内部の孔部１ａは、他の部位より大きな径を有する空間を形成し、潤滑油２５が充填される溜まり部となっている。

【００１９】図４図示の流体軸受けを組立てるに際しては、軸受１の孔部１ａに軸２を挿入しブレート３を下から嵌合し、ブレート３の外周を軸受１下部に接着又はカシメ等で固定する。

【００２０】次に組立て後の流体軸受けに潤滑油を注入、充填する方法を図１を用いて順を追って説明する。

【００２１】図１（Ａ）は、軸受１と軸２及びブレート３の間隙部（潤滑油を保持すべき所定空間）に潤滑油２５を供給する説明図である。図示の如く軸受１を低速で回転させながらディスペンサー４を軸２に添接しつつ潤滑油２５を孔部１ａの上方にある開口部周縁に静かに滴下して供給する。この時点で軸受隙間には空気があり、また潤滑油２５は軸受の間隙部の入り口付近にとどまり所定空間全体へ十分に行き渡っていない。

【００２２】次に図１（Ｂ）のように、潤滑油を注入した組立て体を、密閉した真空用チャンバー７に格納し、真空ポンプ６で内部の空気を０．０１～０．００１Ｐａまで減圧する。これにより軸受隙間部に残存した空気が気泡として除去（排気）される。

【００２３】続いて図１（Ｃ）のように、絞り弁２４を開け真空用チャンバー７に空気を入れて、内部の圧力を徐々に常圧に復帰させる。チャンバー７内に戻る空気によって、潤滑油をより内部へ押しこめるよう外部から圧力が加わるので、潤滑油が流体軸受けとして潤滑油を保持すべき所定空間（間隙部、孔部１ａ内部）の隅々まで行き渡り押圧充填がなされる。充填後の潤滑油内部に残る気泡は１％以下となる。またこの時温度を６０℃～１００℃に保持すればさらに気泡の量が減少する。

【００２４】次に図１（Ｄ）のように、所定空間である間隙部を満たし溢れ出た余剰量の潤滑油を真鍮又は銅製等の金属あるいはビニール等樹脂性の管１４で減圧吸引１０する。吸引された余剰分の潤滑油は潤滑油溜り１８に溜まる。以上の方法により潤滑油内部に残留する気泡の量を局限し、流体軸受けとして必要な所定空間内全てにもれなく潤滑油を充填し、余剰分の潤滑油を除去した流体軸受けの組立て体が完成する。

【００２５】図２は本実施例の他の好ましい構成として、潤滑油供給する部位である孔部１ａ開口部周囲に凹部１１を設け、より多くの潤滑油を流れ出ることなく効率良く注入可能とするとともに、余剰量の潤滑油を除去しやすくした構成の流体軸受け組立て体の断面図である。

【００２６】図３は本発明の他の実施例として、孔部１ａ開口部の周囲に撥油剤２０を塗付した撥油剤塗布領域を設けた流体軸受６０として構成し、スピンドルモータの実使用回転数よりも低速で回転させながら間隙部に潤滑油を注入している状態の説明図である。図３図示の流体軸受６０を搭載したスピンドルモータは、軸受け１の開口端部（孔部１ａの周辺）に撥油剤２０を塗布してあるので端部の残存潤滑油は、既に所定空間内に充填された必要量と分離され容易に除去出来る効果を発揮する。

【００２７】図５は、潤滑油２５を充填すべき所定空間である間隙部を満たし溢れ出た余剰量の潤滑油を除去する本実施例の他の方法を説明する図であり、図示の如く軸受け組立て体を覆う潤滑油飛散防止カバー５０内で、軸受の実使用回転数よりさらに早く回転させ、回転遠心力により潤滑油を除去する工程の説明図である。図５図示の方法によれば、遠心力により、より強力確実に潤滑油を除去でき、また先に説明したノズルで吸い取る方法と比較して作業が単純化され、より自動化が容易である、等の効果がある。

【００２８】以上説明した本発明の実施例によれば、潤滑油中の気泡を少なくすることが出来、軸受間隙部分の体積のバラツキに関係なく潤滑油を満たすことが出来る効果がある。更に潤滑油の中に浸漬する方法と異なり、潤滑油供給部のみ、潤滑油を除去すれば良いので作業が簡単で済む。潤滑油供給部に撥油剤を塗布する事により簡単確実に潤滑油を除去出来る、等の効果が得られる。

【００２９】

【発明の効果】以上詳述した如く、本発明は、特に開穴部に挿入された軸体の外周面に添接しつつ開穴部周縁へ粘性流体を所定量滴下する滴下ステップと、次に、粘性流体を滴下した組立体の外部を減圧状態にして、開穴部側から挿入穴内の空気を排気する排気ステップと、次に、減圧状態が常圧状態に復帰する際の大気圧で開穴部周縁の粘性流体を挿入穴内に充填する充填ステップとを有することにより、流体軸受に保持される粘性流体中の不要、有害な気泡を確実に除去し、粘性流体が充填されるべき空間に隙間無く確実に粘性流体を充填し、また余剰量の粘性流体を容易に除去可能として、動圧にムラが生じる恐れがなく、また潤滑油等の粘性流体が不浄物質となってディスク記録媒体を汚染する恐れもない流体軸受の粘性流体充填方法を提供することができる。

【図面の簡単な説明】

【図１】　本発明の流体軸受の粘性流体充填方法、モータの一実施例における粘性流体充填を行なう各工程の説明図である。

【図２】　図１のモータにおいて潤滑油を供給するための凹部を設けた構成の流体軸受けの断面図である。

【図３】　本発明のモータの一実施例において撥油剤塗布領域を有する流体軸受けの断面図である。

【図４】　図１のモータの流体軸受けの組立図である。

【図５】　図１のモータにおいて遠心力により余剰の潤滑油を除去する工程の説明図である。

【図６】　図１のモータの断面図である。

【符号の説明】

１　軸受（流体軸受部）

１ａ　孔部（挿入穴）

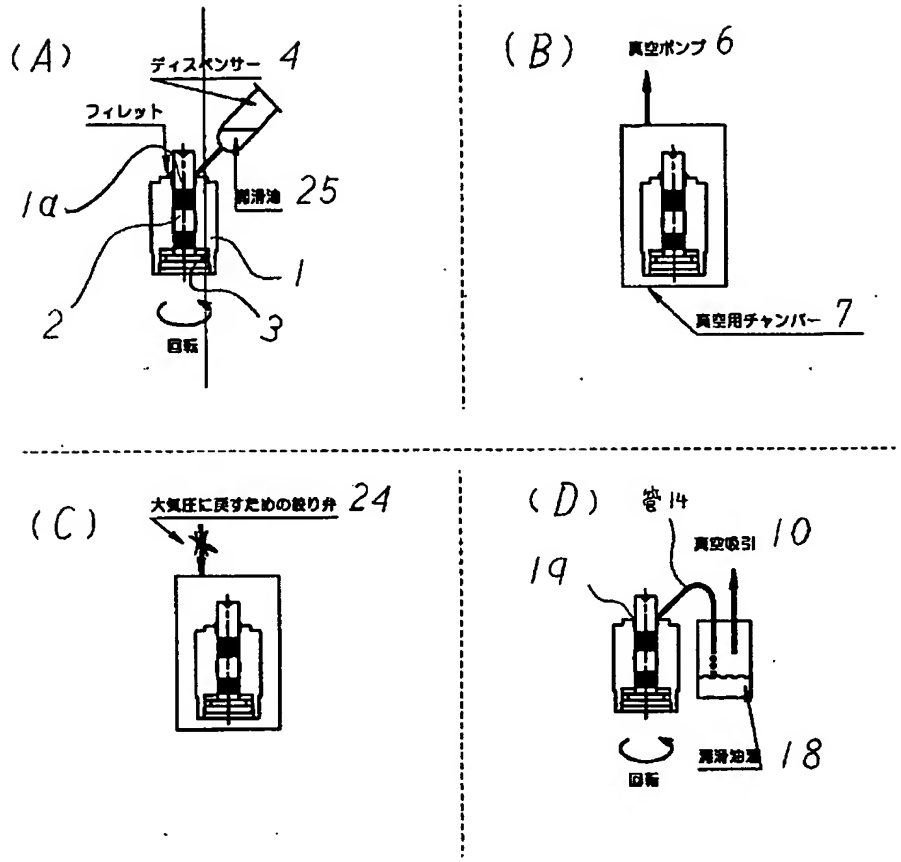
２　軸（軸体）

９　モータベース（ステータ）

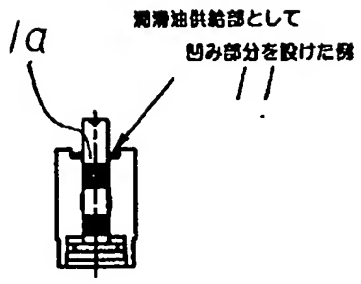
２５　潤滑油（粘性流体）

１００　ＣＤ－ＲＯＭドライブ用スピンドルモータ（モータ）

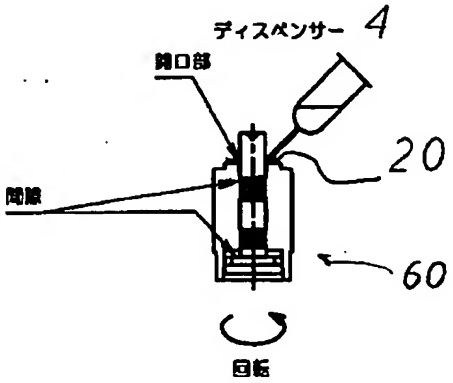
【図1】


(A)
ディスペンサー 4
フィレット
1a
潤滑油 25
1
2
3
回転
(B)
真空ポンプ 6
真空用チャンバー 7
(C)
大気圧に戻すための絞り弁 24
(D)
管 14
真空吸引 10
19
潤滑油溜 18
回転

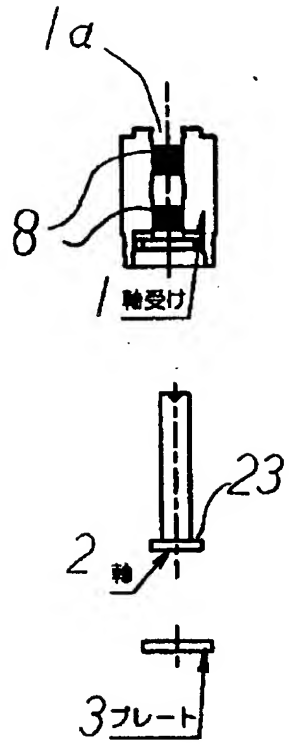
【図2】


1a
潤滑油供給部として
凹み部分を設けた例
11

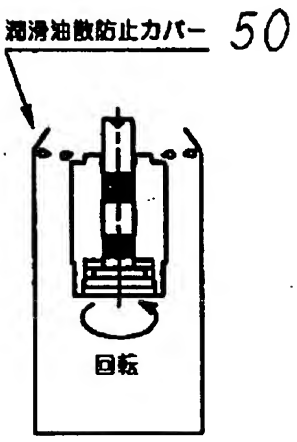
【図3】


ディスペンサー 4
開口部
20
間隙
60
回転

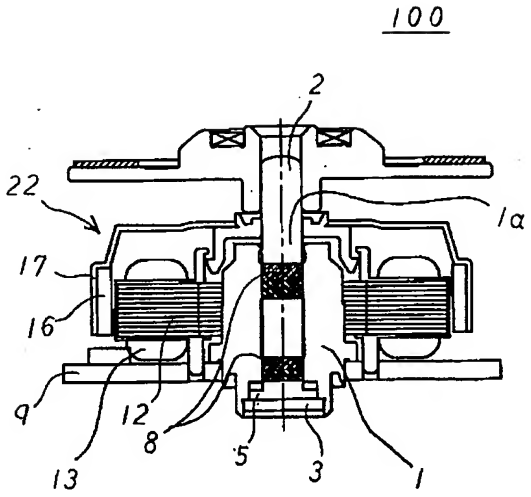
【図４】


1a
8
1
軸受け
23
2
軸
3
プレート

【図５】


潤滑油散防止カバー
50
回転

【図６】


100
2
22
1a
17
16
9
12
8
5
3
1
13

PATENT ABSTRACTS OF JAPAN

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(71)Applicant : VICTOR CO OF JAPAN LTD

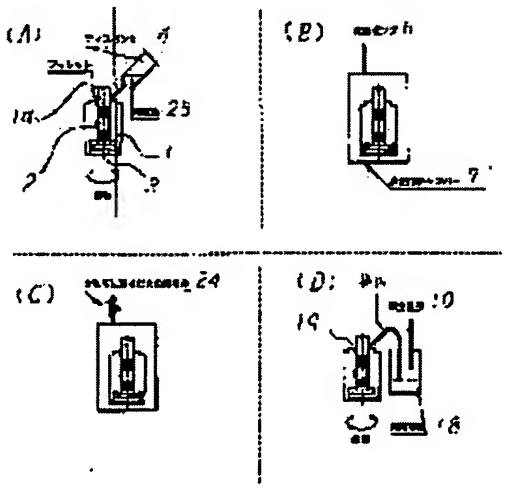
(72)Inventor : MASUDA SUSUMU

(54) VISCOUS FLUID CHARGING METHOD OF FLUID BEARING, AND MOTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a viscous fluid charging method of a fluid bearing generating no irregulality in generating of dynamic pressure, by certainly removing bubble in lubricating oil 25, viscous fluid generating the dynamic pressure, and certainly charging the lubricating oil in a predetermined space.

SOLUTION: In this charging method, pressure of environment around an assembly body into which the lubricating oil 25 has been injected is reduced to previously exhaust air inside the bearing (process shown in Fig. 1 (B)), and then the pressure of the environment around the assembly body is returned to a normal value to press and charge the viscous fluid into the predetermined space (process shown in Fig. 1 (C)).



LEGAL STATUS

[Date of request for examination]

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[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] The inner skin section close to the peripheral face of an axis and said axis inserted toward a pars-basilaris-ossis-occipitalis side from the puncturing section so that it may be pivotable, It can set to the assembly possessing fluid bearing which has the insertion hole which forms successively in this inner skin section, and counters the peripheral face of said axis with a predetermined opening, and which collected and was equipped with the section. The dropping step which is the viscous fluid restoration approach of the liquid bearing which fills up the inside of said insertion hole with the viscous fluid dropped at said puncturing section periphery, and carries out specified quantity dropping of the viscous fluid to said puncturing section periphery, carrying out a splice to the peripheral face of said axis inserted in said puncturing section, Next, the exhaust air step which changes into a reduced pressure condition the exterior of said assembly which trickled viscous fluid, and exhausts the air in said insertion hole from said puncturing section side, Next, the viscous fluid restoration approach of the liquid bearing characterized by having the restoration step which fills up the viscous fluid of said

puncturing section periphery with the atmospheric pressure at the time of a reduced pressure condition returning to an ordinary pressure condition in said insertion hole.
[Claim 2] The motor which is a motor constituted using said assembly with which it filled up with viscous fluid by the viscous fluid restoration approach of a liquid bearing according to claim 1, and is characterized by having the stator which fixed the pars basilaris ossis occipitalis of said assembly.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the viscous fluid restoration approach of the liquid bearing at the time of manufacturing for example, the object for hard disk drives (HDD) or the motor for CD-ROM drives, and this motor.
[0002]
[Description of the Prior Art] The motor which has the liquid bearing which a bearing object supports for an axis with the dynamic pressure which is conventionally equipped with the viscous fluid (a lubricating oil, air, etc.) held in the predetermined space where an axis (a shaft, shaft), the bearing object (bearing, a sleeve, fluid bearing) which has the pore (insertion hole) in which an axis is inserted, and an axis and a bearing object face each other, and produces in viscous fluid at the time of relative rotation with an axis and a bearing object, enabling free rotation is common knowledge.
[0003] Moreover, the following were conventionally known as an approach of pouring liquefied viscous fluid, such as a lubricating oil, into a liquid bearing as viscous fluid which generates dynamic pressure. Namely, the method of decompressing the whole equipment and pouring in

a lubricating oil, after dipping the whole (1) bearing equipment into a lubricating oil (a publication in a U.S. Pat. No. 5112142 number official report) How (it is described as "the 2nd conventional technique" below) to apply to the peripheral face of a bearing assembly object (2) lubricating oils described as "the 1st conventional technique" below, and to pour them in by capillarity, (3) How to apply the lubricating oil to the components which constitute a liquid bearing before assembling bearing equipment beforehand (it is described as "the 3rd conventional technique" below), (4) They are the approach (it is described as "the 4th conventional technique" below) of making a lubricating oil pouring in and permeating the bottom of an ordinary pressure environment from bearing opening after the assembly of bearing equipment, the approach (it is described as "the 5th conventional technique" below) of applying the lubricating oil which is viscous fluid with an assembly about the components which constitute (5) bearing several times, etc.

[0004]

[Problem(s) to be Solved by the Invention] The important point on the motor assembly in the case of using a liquid bearing for the motor for HDD or the motor for CD-ROM drives is there being no air bubbles and making it a lubricating oil unnecessary for the periphery section of a motor and harmful not remain into the lubricating oil of the dynamic pressure generating section. The reason which should be carried out so is that there is a possibility of becoming the impure matter, adhering to a disk record medium etc., and checking the function of disk-media drive equipment and the engine performance when there is a possibility that nonuniformity may arise in generating of dynamic pressure and it may not function normally as a liquid bearing when air bubbles remain into a lubricating oil, and a lubricating oil unnecessary for the motor periphery section remains.

[0005] However, the 1st above-mentioned conventional technique was not simple for there to be a problem that the lubricating oil adhering to garbages other than the whole bearing device table side needs to be removed, and to remove completely unnecessary lubricating oils other than a bearing gap part. For this reason, although the technique of JP,8-270653,A according to claim 3 is devised, a new problem [say / that a process increases and effectiveness worsens] was produced.

[0006] Moreover, air bubbles remained in the part with which it is difficult to fill a lubricating oil into all the gap parts, and a lubricating oil is not filled, and the conventional technique of the above 2nd had the problem that air bubbles were unremovable. There was each problem that the conventional technique of the above 3rd furthermore has a possibility of becoming spreading of spreading unevenness or an ununiformity, skill was required for an activity, the conventional technique of the above 4th more took assembly time amount, and the conventional technique of the above 5th required an excessive man day.

[0007] Then, the dropping step which carries out specified quantity dropping of the viscous

fluid to a puncturing section periphery, carrying out a splice to the peripheral face of the axis which this invention was made in view of the above-mentioned trouble, and was inserted especially in the puncturing section, Next, the exhaust air step which changes into a reduced pressure condition the exterior of the assembly which trickled viscous fluid, and exhausts the air in an insertion hole from a puncturing section side, Next, by having the restoration step which fills up the viscous fluid of a puncturing section periphery with the atmospheric pressure at the time of a reduced pressure condition returning to an ordinary pressure condition in an insertion hole Remove certainly the unnecessary and harmful air bubbles in the viscous fluid held at a liquid bearing, and it is filled up with viscous fluid certainly [there is no clearance in the space where it should fill up with viscous fluid, and], and removal of the viscous fluid of the amount of surpluses is enabled easily. It aims at offering the viscous fluid restoration approach of the liquid bearing which a possibility of there being no possibility that nonuniformity may arise in dynamic pressure, and viscous fluid, such as a lubricating oil, serving as impure matter, and polluting a disk record medium does not have, either.

[0008]

[Means for Solving the Problem] In order to solve the technical problem mentioned above, this invention offers the viscous fluid restoration approach of the liquid bearing of following (1) and (2), and a motor.

(1) The inner skin section (pore 1a inner skin) close to the peripheral face of an axis (a shaft, shaft) 2 and said axis 2 inserted toward a pars-basilaris-ossis-occipitalis side (drawing 6 motor base side) from the puncturing section (opening of the pore 1a upper part) so that it may be pivotable, It can set to the assembly possessing the fluid bearing (bearing) 1 which has insertion hole (pore) 1a which forms successively in this inner skin section, and counters the peripheral face of said axis 2 with a predetermined opening, and which collected and was equipped with the section (space of the pore 1a lower part of the bearing 1 interior). It is the viscous fluid restoration approach of the liquid bearing which fills up the inside of said insertion hole with the viscous fluid (lubricating oil) 25 dropped at said puncturing section periphery. The dropping step which carries out specified quantity dropping of the viscous fluid 25 to said puncturing section periphery, carrying out a splice to the peripheral face of said axis 2 inserted in said puncturing section (process of the drawing 1 (A) illustration), Next, the exterior of said assembly which trickled viscous fluid 25 is changed into a reduced pressure condition. The exhaust air step which exhausts the air in said insertion hole 1a from said puncturing section side (process of the drawing 1 (B) illustration), Next, the viscous fluid restoration approach of the liquid bearing characterized by having the restoration step (process of the drawing 1 (C) illustration) which fills up the viscous fluid 25 of said puncturing section periphery with the atmospheric pressure at the time of a reduced pressure condition returning to an ordinary pressure condition in said insertion hole 1a.

(2) The motor 100 which is a motor constituted using said assembly with which it filled up with viscous fluid (lubricating oil) 25 by the viscous fluid restoration approach of a liquid bearing according to claim 1, and is characterized by having the stator (the drawing 6 motor base) 9 which fixed the pars basilaris ossis occipitalis (pars basilaris ossis occipitalis of the drawing 6 bearing 1) of said assembly (spindle motor for the drawing 6 CD-ROM drives).

[0009]

[Embodiment of the Invention] Hereafter, a desirable example is explained using drawing 1 thru/or drawing 6 per gestalt of operation of this invention. The explanatory view of each process in which drawing 1 performs viscous fluid restoration in the viscous fluid restoration approach of the liquid bearing of this invention, and one example of a motor, The sectional view of the fluid bearing of a configuration of having prepared the crevice for drawing 2 supplying a lubricating oil in the motor of drawing 1 , The explanatory view of a process from which the sectional view of a fluid bearing where drawing 3 has an oil repellent agent spreading field in one example of the motor of this invention, and drawing 4 are set to the assembly drawing of the fluid bearing of the motor of drawing 1 , drawing 5 is set on the motor of drawing 1 , and an excessive lubricating oil is removed according to a centrifugal force, and drawing 6 are the sectional views of the motor of drawing 1 . The same sign is given to the same part as what was mentioned above, and the explanation is omitted.

[0010] First, the structure of the spindle motor 100 for CD-ROM drives which is a motor of this example is explained using the sectional view of drawing 6 .

[0011] In drawing 6 , the lower limit (pars basilaris ossis occipitalis) of the bearing 1 of a spindle motor 100 is being fixed to the motor base 9 formed by the iron base printed circuit board. Moreover, bearing 1 and the shaft 2 inserted in pore 1a formed in bearing 1 constitute the liquid bearing.

[0012] The dynamic pressure slot 8 which generates dynamic pressure at the time of rotation is formed in bearing 1 inner circumference and/or shaft 2 periphery, and is considering radial bearing which is the fluid bearing which supports a shaft 2 to a radial direction as the configuration which bearing 1 supports for a shaft 2, enabling free rotation with the dynamic pressure generated in viscous fluid at the time of rotation of a shaft 2. In addition, the dynamic pressure slot 8 of the drawing 6 illustration is drawn typically superficially.

[0013] The thrust bearing 5 which is the fluid bearing which supports a shaft 2 in the thrust direction processes a spiral-like dynamic pressure slot (un-illustrating) on the correspondence side of respectively the upper and lower sides to the thrust section formed in the lower limit of a shaft 2, and constitutes the liquid bearing. (The direction of up-and-down is based on the posture of the drawing 6 illustration.) the following -- the same --

[0014] In addition, the same effectiveness is acquired whichever a dynamic pressure slot processes a field. It fills up with a lubricating oil in the predetermined space between a shaft 2

and bearing 1, dynamic pressure arises inside a lubricating oil by rotation of a shaft 2, and it functions as bearing equipment.

[0015] Since rotation of it will become impossible if the lubricating oil of a liquid bearing flows into the bearing exterior by rotation of a shaft 2 or bearing 1, it constituted the seal section in the upper and lower sides of a fluid bearing, and has prevented the outflow.

[0016] The core 12 which wound the coil 13 around the motor base 9 concentrically to bearing 1 was fixed, it had Rota York 17 in Rota 22 held by the liquid bearing free [rotation], and the ring-like magnet 16 has fixed to the lower inner circumference side.

[0017] Next, the restoration approach into the predetermined space which should be filled up with the lubricating oil in the liquid bearing of a spindle motor 100 is explained.

[0018] If the assembly drawing of drawing 4 explains the configuration of a fluid bearing first, two dynamic pressure slots 8 will be formed in the pore 1a inner circumference section, bearing 1 will equip shaft 2 lower limit with the thrust section 23 which has an up-and-down field, and the plate 3 will form the dynamic pressure slot in thrust-section 23 inferior surface of tongue of a shaft 2, and the field which counters. The space which has a bigger path than other parts is formed, it fills up with a lubricating oil 25, and pore 1a of the bearing 1 interior which contains a thrust section 23 collects, and has become the section.

[0019] It faces assembling the fluid bearing of the drawing 4 illustration, and a shaft 2 is inserted in pore 1a of bearing 1, a plate 3 is fitted in from the bottom, and the periphery of a plate 3 is fixed to the bearing 1 lower part with adhesion or caulking.

[0020] Next, order is explained for the approach of injecting a lubricating oil into the fluid bearing after an assembly, and filling it up later on using drawing 1 .

[0021] Drawing 1 (A) is an explanatory view which supplies a lubricating oil 25 to the gap section (predetermined space which should hold a lubricating oil) of bearing 1, a shaft 2, and a plate 3. Carrying out the splice of the dispenser 4 to a shaft 2 rotating bearing 1 like illustration at a low speed, a lubricating oil 25 is calmly dropped at the opening periphery which is above pore 1a, and is supplied to it. There is air in a bearing clearance at this time, and a lubricating oil 25 remains near the entry of the gap section of bearing, and has not fully spread round the whole predetermined space.

[0022] Next, the assembly object which poured in the lubricating oil is stored in the sealed chamber 7 for vacuums like drawing 1 (B), and internal air is decompressed to 0.01-0.001Pa with a vacuum pump 6. Air which remained in bearing spare time Mabe by this is removed as air bubbles (exhaust air).

[0023] Then, like drawing 1 (C), a throttle valve 24 is opened, air is put into the chamber 7 for vacuums, and an internal pressure is gradually returned to ordinary pressure. With the air which returns in a chamber 7, since a pressure is added from the exterior so that a lubricating oil may be pushed in more inside, a lubricating oil spreads to all the corners of the

predetermined space (gap section, interior of pore 1a) which should hold a lubricating oil as a fluid bearing, and press restoration is made. The air bubbles which remain in the interior of the lubricating oil after restoration become 1% or less. Moreover, if temperature is held at 60 degrees C - 100 degrees C at this time, the amount of air bubbles will decrease further.

[0024] Next, the lubricating oil of the amount of surpluses which filled the gap section which is predetermined space like drawing 1 (D), and overflowed is carried out reduced pressure suction 10 with the tubing 14 of resins, such as a metal or vinyl, such as brass or copper. The attracted lubricating oil for a surplus collects on the lubrication oil sump 18. The amount of the air bubbles which remain inside a lubricating oil by the above approach is localized, and it does not leak to all in predetermined space required as a fluid bearing, and is filled up with a lubricating oil, and the assembly object of a fluid bearing from which the lubricating oil for a surplus was removed is completed.

[0025] Drawing 2 is the sectional view of the fluid bearing assembly object of a configuration of having made the lubricating oil of the amount of surpluses easy to remove while making impregnation it is efficient and possible, without establishing a crevice 11 in the perimeter of pore 1a opening which is the part which carries out lubricating oil supply as other desirable configurations of this example, and flowing out more lubricating oils.

[0026] Drawing 3 is an explanatory view in the condition of pouring the lubricating oil into the gap section, constituting as a liquid bearing 60 which established the oil repellent agent spreading field which carried out the oil repellent agent 20 with ** in the perimeter of pore 1a opening as other examples of this invention, and making it rotate rather than the real use rotational frequency of a spindle motor at a low speed. Since the spindle motor which carried the liquid bearing 60 of the drawing 3 illustration has applied the oil repellent agent 20 to the open end (circumference of pore 1a) of a bearing 1, the residual lubricating oil of an edge demonstrates the effectiveness which dissociates with the initial complement with which it already filled up in predetermined space, and can be removed easily.

[0027] Drawing 5 is drawing explaining other approaches of this example which removes the lubricating oil of the amount of surpluses which filled the gap section which is the predetermined space which should be filled up with a lubricating oil 25, and overflowed, and is an explanatory view of a process from which a bearing assembly object is early rotated further from the real use rotational frequency of bearing within the wrap lubricating oil scattering prevention covering 50, and a lubricating oil is removed according to a rotation centrifugal force like illustration. According to the approach of the drawing 5 illustration, an activity is simplified as compared with the approach of sucking up with the nozzle which could remove the lubricating oil more powerfully certainly and was previously explained according to the centrifugal force, and there is effectiveness of ** that automation is more easy.

[0028] According to the example of this invention explained above, the air bubbles in a

lubricating oil can be lessened and it is effective in the ability to fill a lubricating oil regardless of the variation in the volume of a bearing gap part. Furthermore, unlike the approach immersed into a lubricating oil, since only a lubricating oil feed zone should remove a lubricating oil, an activity is easy and ends. The effectiveness of ** that a lubricating oil is certainly [simply] removable is acquired by applying an oil repellent agent to a lubricating oil feed zone.

[0029]

[Effect of the Invention] The dropping step which carries out specified quantity dropping of the viscous fluid to a puncturing section periphery, carrying out the splice especially of this invention to the peripheral face of the axis inserted in the puncturing section as explained in full detail above, Next, the exhaust air step which changes into a reduced pressure condition the exterior of the assembly which trickled viscous fluid, and exhausts the air in an insertion hole from a puncturing section side, Next, by having the restoration step which fills up the viscous fluid of a puncturing section periphery with the atmospheric pressure at the time of a reduced pressure condition returning to an ordinary pressure condition in an insertion hole Remove certainly the unnecessary and harmful air bubbles in the viscous fluid held at a liquid bearing, and it is filled up with viscous fluid certainly [there is no clearance in the space where it should fill up with viscous fluid, and], and removal of the viscous fluid of the amount of surpluses is enabled easily. The viscous fluid restoration approach of the liquid bearing which a possibility of there being no possibility that nonuniformity may arise in dynamic pressure, and viscous fluid, such as a lubricating oil, serving as impure matter, and polluting a disk record medium does not have, either can be offered.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the explanatory view of each process which performs viscous fluid restoration in the viscous fluid restoration approach of the liquid bearing of this invention, and one example of a motor.

[Drawing 2] It is the sectional view of the fluid bearing of a configuration of having prepared the crevice for supplying a lubricating oil in the motor of drawing 1 .

[Drawing 3] It is the sectional view of the fluid bearing which has an oil repellent agent spreading field in one example of the motor of this invention.

[Drawing 4] It is the assembly drawing of the fluid bearing of the motor of drawing 1 .

[Drawing 5] It is the explanatory view of a process from which an excessive lubricating oil is removed according to a centrifugal force in the motor of drawing 1 .

[Drawing 6] It is the sectional view of the motor of drawing 1 .

[Description of Notations]

1 Bearing (Fluid Bearing)

1a Pore (insertion hole)

2 Shaft (Axis)

9 Motor Base (Stator)

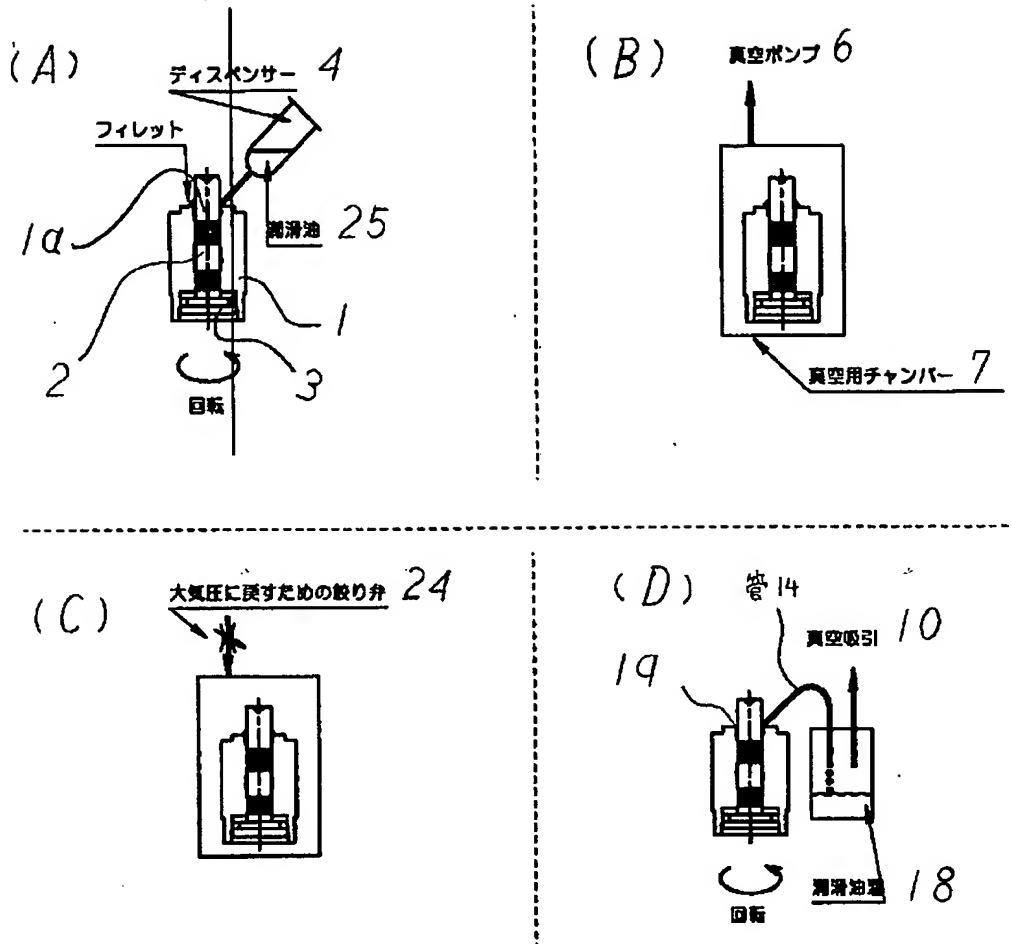
25 Lubricating Oil (Viscous Fluid)

100 Spindle Motor for CD-ROM Drives (Motor)

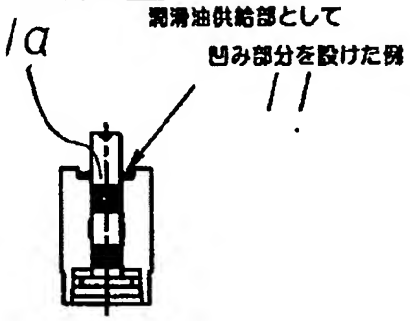
[Translation done.]

DRAWINGS

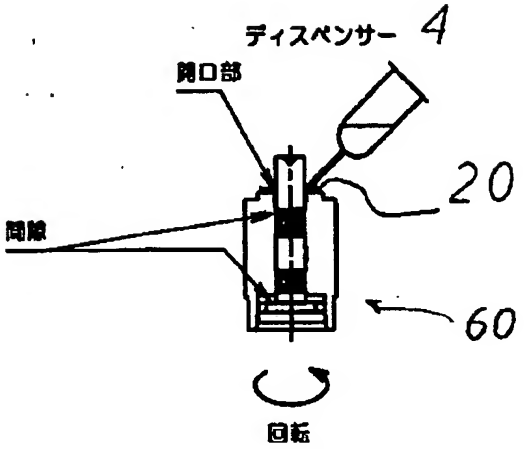
[Drawing 1]



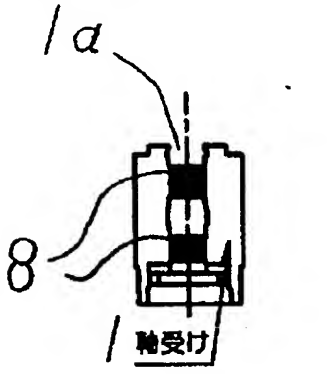
[Drawing 2]

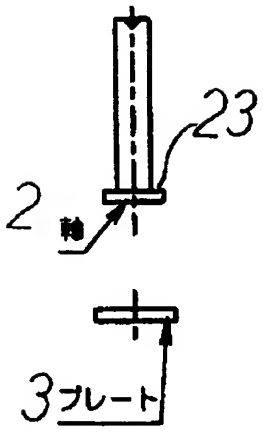


[Drawing 3]

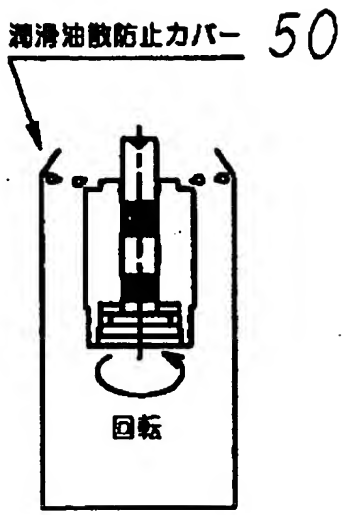


[Drawing 4]

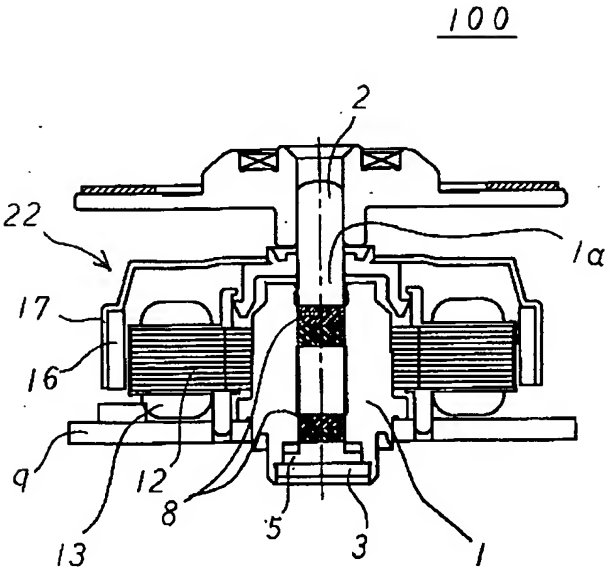




[Drawing 5]



[Drawing 6]



[Translation done.]